ABSTRACT

THESIS: EXPLORING THE WATER RESOURCE SYSTEM AND THE MULTI-FUNCTIONALITY OF DRINKING WATER QUALITY OF THE SAGARMATHA NATIONAL PARK, NEPAL

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The Sagarmatha National Park (SNP), Nepal is regarded as one of the most beautiful mountain tourism sites in the world. Tourism provides the majority of the capital for the SNP, however, the protected mountain region has experienced negative effects for those capital gains. Corruption and governance issues related to the tourism industry in Nepal have resulted in conflicts regarding environmental cooperation, skewed caste systems, and poor management of natural resources. The basic human rights of the residents and the well being of tourists of the SNP are being infringed upon, as access to clean drinking water is being compromised. This thesis explores the multi-functionality of drinking water as it relates to basic human rights, governance, and environmental policy in the Sagarmatha National Park.

Identifying common drinking water contaminants by assessing the overall drinking water quality in the SNP was the main objective of this study. The second objective of this study was to establish a water quality data set which can be used to create a comprehensive map of water quality for the Sagarmatha National Park region for future studies. The final objective of this study was to review the current environmental policy standards in the SNP, comparing them to international water quality standards and identifying any improvements to policy based on the research

conducted. Understanding the current governance of the SNP and the effects of tourism on the region was important in fulfilling this objective. The outcomes of these three objectives are necessary for providing essential accurate water quality information to the residents of the SNP and the scientific community.

A survey of drinking water sources in the SNP was completed to assess bacterial contamination and its association with tourism. Analysis of fecal coliforms in surface and drinking water sources followed standard U.S. Environmental Protection Agency (EPA) and World Health Organization (WHO) approved methods. Temperature, pH, conductivity, and total dissolved solids (TDS) were measured in the field on the basis of general drinking water quality standards.

Overall, the data we collected presented a predictable correlation between fecal contamination and both decreasing elevation and increasing population/tourist traffic. Drinking water within the study area meets current WHO drinking water standards for temperature (2.8°C - 13°C), pH (5.27 - 7.24), conductivity (17.87 μS - 133 μS) and TDS (7.24 ppm - 65.5 ppm). A total 41 samples were collected for this study: 5 were collected and analyzed for bacteria in May and all tested positive for *E. coli*; 5 of the 36 samples collected and analyzed in November also tested positive for *E. coli*. Samples collected and analyzed in May (pre-monsoon summer) had a higher concentration of *E. coli* and coliform bacteria than samples collected in November (post-monsoon early winter) suggesting a seasonal dependence. Samples from the more populated, lower altitude, areas had higher levels of *E. coli* as well. Physical parameters measured in the field, temperature, pH, TDS and conductivity, decreased with increasing elevation, and proved poor indicators of water contamination.

The data presented in this thesis clearly indicate a significant presence of bacterial indicators of fecal pollution in the surface waters of the Sagarmatha National Park, Nepal. The proper balance of tourism and natural resource management strategies must be a priority as increasing tourist numbers and the influence of climate change will result in poorer drinking water conditions in the SNP.